

test of centuries, and will no doubt continue to resist the injuries of time for centuries yet to come, affording striking proof of the durability of stone constructions; and as iron as a material for bridges (more particularly as applied in suspension bridges) is comparatively of modern introduction, and as its properties are but imperfectly developed and understood, I think it would be premature in us to pronounce an opinion upon its merits and fitness for such structures in the present state of the question, till time and experience have more fully tested its qualities."

Professor Hocking says, "Stone is, however, pre-eminently the bridge builder's material. The carpenter can supply the want of a bridge in a comparatively short time, and in most cases at a small cost. The smith and founder will, with moderate assistance from the mason and bricklayer, effect what cannot be done with stone, and will in cases supply the place of stone with iron when stone might be used, but grandeur of effect, power of resistance and eternity of endurance, are to be sought in masonry, the mason's art, and with the mason's material!! We know of and possess nothing as a material for massive, permanent construction, and fitted for bridge building particularly, so free from liability to change in bulk from any natural influence as stone: and nothing, therefore, considering its other qualities as essential, so well adapted for the main constituent of a bridge."

It is well known that iron is injuriously affected by many causes that produce little or no impression on stone; viz., by atmospheric changes, electricity, continual percussion, vibration, galvanic action, &c.; it is liable to oxidation (a suspension bridge being composed of a series of small bars of iron presents a great surface to the corroding powers of the atmosphere), which in a series of years seriously impairs its strength, notwithstanding the precautions taken to preserve it; and percussion and vibration operate so injuriously upon it, as altogether to alter its internal structure and destroy its tenacity; in proof of which see the accounts of the numerous accidents that have occurred on the various lines of railway from the fracture of the axles of railway carriages, &c., and the discussions that have taken place on the subject at our scientific institutions.

I have observed in the fractures of iron axles that the internal character of the iron was completely changed, having formed into large crystals, while the external parts of the fracture presented a discoloured and smooth surface, as if it had commenced there, and gradually extended itself to the centre, until the axle was unable to bear the weight imposed upon it. Mr. Glynn, civil engineer, in showing the effect of percussion upon iron, observes, "that the breaking action of railway axles commences with the first journey, and that they continually receive such injury as they would if they were laid over the edge of an anvil and received a constant succession of smart blows from a hammer."

"I consider the chains, or rather the bar, of a suspension bridge would be similarly operated on by the passing traffic, and this would readily account for the failure of the Yarmouth Bridge, as it was distinctly stated in evidence that more than double the number of persons had been upon the bridge at one time since it was widened than were upon it at the time of the accident; under these circumstances we should naturally have supposed that the failure would have taken place then when the greatest weight was upon it; and the inference I draw from this is, that some other cause than the one attributed occasioned that sad catastrophe. I am quite aware that smiths, in welding bars of iron, do not always bestow that attention to it they ought to do; and this shows the necessity of having iron properly tested; that is likely to be subject to much strain; and as it is the usual practice to prove it to a much greater weight than it is intended to support, the iron even in that operation may sustain an imperceptible injury, and fail under much less weight than it was calculated to bear when applied in its proper place."

To obviate the danger arising from the breaking of the axles of railway carriages, it has been recommended to change them frequently; but to change the bars, plates, bolts, &c. of a suspension bridge would be rather an inconvenient and expensive operation. There

is another subject to which I wish to draw your attention, and that is, the undulating and oscillating motion of suspension bridges; it is this circumstance that precludes the possibility of railway companies adopting them, in consequence of the great danger attending the passage of a heavy weight, concentrated to one point, and the sudden percussive action of a railway train.

The tremulous motion upon the Hungerford and other foot bridges is unpleasant to foot passengers, and the passage of the ordinary traffic over the Menai and other bridges opened for general purposes is particularly disagreeable; and I am informed that, during a heavy gale of wind, it is almost impossible to pass over the Menai and other bridges similarly exposed. This is occasioned by the want of rigidity or stiffness, which has not yet been attained in suspension bridges, and which it seems almost impossible to attain, in consequence of the effect variations in temperature produce upon iron chains of great length. This to a bridge of large span exposed to gales of wind, operating both sideways and underneath the roadway, must be ruinous in the extreme; in confirmation of which I may instance the injuries sustained some time ago by the Menai, Montrose, and other bridges, the chain-pier, Brighton, &c. Mr. Dredge's bridges have hitherto been constructed on a small scale, and in favourable situations. I am apprehensive, if the principle was carried out on a large scale, and in similar trying situations to those alluded to, it would be attended with no better result. Mr. Dredge, I hope, will have the opportunity of trying his suspension bridge at Weston-super-Mare, where its advantages and powers may be fully proved; although I consider such a situation the least suitable for iron structures, from the injurious effects of salt water upon iron.

On the correctness of Mr. Dredge's system or theory, I shall not attempt to enter, my object being to show the superiority of bridges of fixed, to those of iron on the suspension principle, wherever it is possible to introduce them, "for heavy general traffic, and where great strength and durability are required."

Suspension bridges, as beautiful picturesque objects, are certainly great embellishments to a landscape, but I think in our public works in this country other points ought to be kept in view; namely, usefulness and durability, combined with economy.—I am, Sir, &c.,
Brecon, July 29, 1845. B. B.

NOTES IN THE PROVINCES.

WITHIN the last few months some rather extensive alterations have been effected in the interior of Durham Cathedral, under the direction of the dean and chapter. The old pulpit has been removed, and one of stone erected in its stead; the pews appropriated to the ladies on the north side of the choir have made way for carved oak benches with backs and cushions. A new font, more in keeping with the general architecture of the church than the present one, will shortly be erected, and the screens which inclosed the side chapels on either side of the organ have been taken down, producing, it is said, a remarkably good and striking effect.—The Earl of Carlisle is making great improvements and additions to his ancient baronial castle, Naworth. Fifty workmen are employed at present, and the interior of the roof of the hall is just completed. It is formed of oak, richly panelled; the height is 30 feet. The dining-room which, before the fire, was separated by a wooden partition from the hall, is now added to it, which makes the entire length 96 feet. The noble proprietor has now decided upon building a new tower, and restoring the ancient entrance on the west side of the castle, which was discovered after the fire, and which is said to have been walled up by Lord William Howard, "Belted Bill," in the reign of James I.—A memorial, numerously signed by the residents of Broad-street, Bristol, was lately presented to the Governor and Directors of the Bank of England, in London, soliciting that the new building, intended as their branch might be forthwith commenced, so as to be finished at the same time as the new Guildhall. The directors, in compliance with the requisition, have commenced taking down the old buildings for that purpose.—

The commissioners of the port and harbour, of Whitby having adopted the plans of Mr. Pickernell, their engineer, for the improvement of the harbour, operations for extending the east pier into deep water were commenced on the 7th instant. Forty feet of foundations in ten stones, 6 feet wide by 3 feet thick, were laid; the bed in the rock so correctly levelled that no part of the superficies varied 1 inch; and the vertical notches filled with broken whinstone and cement in seventy-seven minutes. From the beginning to pump the water out of the dam, to the foundation-stones being covered by the flowing tide, two hours only intervened.—On the 17th ultimo, the ceremony of opening the chancel of Leamington church took place in the presence of fifty clergymen. The church is being reconstructed in a style of cathedral grandeur, the chancel and only being as yet completed. Its new nave is so lofty, that it covered in the tower of the old parish church, which was left to stand for some time within the building, as it afforded the workmen the means of elevating their scaffolding upon it, while they carried up the works to at least 25 feet above the altitude of the once much thought of tower! After this tower had been thus useful, as a mere scaffold pole to the inside of a new and spacious structure which was raised above it, the removal of it as an obstruction then commenced, and now there exists not a single vestige of the ancient village church of Leamington.—Lady Bassett, daughter of the Earl de Dunstanville, has subscribed 1,000*l.* towards the fund for the erection of a new church at Illogan.—Nearly four acres of the space heretofore known as the New Buildings, Portsea, have been purchased by Government, at a cost of little less than 60,000*l.*, for the formation of a basin for steam-vessels. One hundred and thirty persons have been ejected, and the ground is already cleared.—A project is being entertained at Sunderland for the construction of docks on an extensive scale. During the last two or three weeks, persons have been employed in surveying, taking levels, and drawing out plans of the moor, as it is called, and the bed of the sea adjoining it, on the west of the town. The line selected is from near behind the present south pier to Hendon, the whole length of the moor, an extent of nearly 3,000 feet, and from the bank of the moor extending into the bed of the sea about 400 feet; the dock is proposed to be 2,500 feet in length and 350 or 360 in breadth, with entrance from both north and south.—Plans are being prepared in accordance with instructions given by the Duke of Sutherland for a new church, which his grace purposes erecting near Longdon. The church is to hold 460 persons, and will be commenced forthwith.—The Town Council of the borough of Doncaster have announced their intention of applying to the Lords Commissioners of her Majesty's Treasury for their approval and permission to erect and build markets for the sale of meat, fish, poultry, &c., and for that purpose to raise a sum of money not exceeding 16,000*l.*—Very extensive improvements have been made during the last two or three years in St. Mary's Church, Truro. Recently two stained-glass windows have been erected at the entrance end. The altar window consists of five compartments; each of which comprises a niche and lofty canopy, in the perpendicular style. In these five principal niches, on rich damascene grounds, are represented full size figures of the Saviour, St. John the Evangelist, St. James the Less, St. Philip and St. Simon. The Saviour holds in his right hand a globe, on which are depicted emblematical representations of the three great eras of the Church; while depending from his arm is a scroll, bearing the inscription, "Surgite, eamus." The four Apostles named bear emblems significant of the mode in which they severally suffered martyrdom; they also bear scrolls with their names inscribed thereon. Above these five principal figures are smaller representations of St. John the Baptist, St. Peter, and St. Paul, with Angels, in attitudes of prayer and praise, and various other appropriate figures and emblems. The south window is mostly emblematical. The body of the window is composed of *quarrels*, interspersed with labels and texts, presenting a quaintly antique appearance, and inclosed by a rich bordering which re-